

Translation

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY  
(Chapter II of the Patent Cooperation Treaty)

28 FEB 2005

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference KP94	FOR FURTHER ACTION	See Form PCT/IPEA/416
International application No. PCT/JP2003/011122	International filing date (day/month/year) 29 August 2003 (29.08.2003)	Priority date (day/month/year) 30 August 2002 (30.08.2002)
International Patent Classification (IPC) or national classification and IPC B01D 53/22, 3/00, C07C 53/08, 51/44, 63/26, 51/265		
Applicant MITSUBISHI HEAVY INDUSTRIES, LTD.		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

3. This report is also accompanied by ANNEXES, comprising:

a. ☐ (sent to the applicant and to the International Bureau) a total of \_\_\_\_\_ sheets, as follows:

☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).

☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.

b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) \_\_\_\_\_, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒ Box No. I Basis of the report

☐ Box No. II Priority

☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

☐ Box No. IV Lack of unity of invention

☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

☐ Box No. VI Certain documents cited

☐ Box No. VII Certain defects in the international application

☐ Box No. VIII Certain observations on the international application

Date of submission of the demand 12 February 2004 (12.02.2004)	Date of completion of this report 07 October 2004 (07.10.2004)
Name and mailing address of the IPEA/JP	Authorized officer
Facsimile No.	Telephone No.

# INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International Application No.

PCT/JP2003/011122

## Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on translations from the original language into the following language \_\_\_\_\_, which is language of a translation furnished for the purpose of:

☐ international search (under Rules 12.3 and 23.1(b))

☐ publication of the international application (under Rule 12.4)

☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the elements of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

☒ The international application as originally filed/furnished

☐ the description:

pages \_\_\_\_\_, as originally filed/furnished

pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

☐ the claims:

pages \_\_\_\_\_, as originally filed/furnished

pages\* \_\_\_\_\_, as amended (together with any statement) under Article 19

pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

☐ the drawings:

pages \_\_\_\_\_, as originally filed/furnished

pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages \_\_\_\_\_

☐ the claims, Nos. \_\_\_\_\_

☐ the drawings, sheets/figs \_\_\_\_\_

☐ the sequence listing (*specify*): \_\_\_\_\_

☐ any table(s) related to sequence listing (*specify*): \_\_\_\_\_

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages \_\_\_\_\_

☐ the claims, Nos. \_\_\_\_\_

☐ the drawings, sheets/figs \_\_\_\_\_

☐ the sequence listing (*specify*): \_\_\_\_\_

☐ any table(s) related to sequence listing (*specify*): \_\_\_\_\_

\* If item 4 applies, some or all of those sheets may be marked "superseded."

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International Application No.

PCT/JP03/11122

**Box No. V** Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

## 1. Statement

Novelty (N)	Claims	2-19	YES
	Claims	1	NO
Inventive step (IS)	Claims	3-19	YES
	Claims	1-2	NO
Industrial applicability (IA)	Claims	1-19	YES
	Claims		NO

## 2. Citations and explanations (Rule 70.7)

Document 1: JP, 60-202705, A (Mitsubishi Heavy Industries, Ltd.), 14 October, 1985 (14.10.85)  
 Document 2: JP, 1-155928, A (Hitachi Zosen Corp.), 19 June, 1989 (19.06.89)  
 Document 3: JP, 2-253802, A (Japan Chemical Eng. & Machinery Co., Ltd.), 12 October, 1990 (12.10.90)  
 Document 4: JP, 2001-328957, A (Mitsui Chemicals, Inc.), 27 November, 2001 (27.11.01)

The subject matter of claim 1 does not appear to be novel or to involve an inventive step in view of documents 1-3 cited in the ISR.

A separation device having (1) a distillation column into which a mixture that contains a first component consisting mainly of water and a second component consisting mainly of a non-water substance is fed, (2) a separator having a separation membrane to separate vapor at the top of the distillation column discharged from the column, and (3) a return-flow device to cool a part of the vapor at the top of the column and have the liquid obtained by the cooling return to the top of the distillation column, is described in documents 1-3.

The subject matter of claim 2 does not appear to involve an inventive step in view of documents 1-3 cited in the ISR.

A person skilled in the art could have easily adopted a well-known type of distillation column with a fluidized bed, as a distillation column.

The subject matter of claim 3 appears to be novel and involve an inventive step.

A constitution of a separation device having a distillation column into which a mixture that contains a first component consisting mainly of water and a second component consisting mainly of a non-water substance is fed, wherein the said device has (1) a first separator having a first separation membrane to separate vapor at the top of the column into a first permeating vapor consisting mainly of a first component and a first non-permeating vapor consisting mainly of a second component, and (2) a second separator having a second separation membrane to separate vapor at the top of the column into (a) a second permeating vapor consisting mainly of the first component in the said first permeating vapor with a higher concentration of the first component than the said first permeating vapor, and (b) a second non-permeating vapor consisting mainly of the said second component, is neither described in any of the documents cited in the ISR nor obvious to a person skilled in the art.

The subject matters of claims 4-6 appear to be novel and to involve an inventive step.

A constitution of a reaction device having a reactor to produce an aromatic carboxylic acid and water from an alkyl aromatic compound, and also generate a mixture vapor containing a solvent and water, wherein the said device has (1) a first separation membrane to separate the mixture vapor discharged into a first permeating vapor consisting mainly of a first component and a first non-permeating vapor consisting mainly of a second component, (2) a second separation membrane to separate the said first non-permeating vapor into a second permeating vapor consisting mainly of the first component and a second non-permeating vapor consisting mainly of the second component, and (3) a return flow passage to condense the said first non-permeating vapor and the said second non-permeating vapor, and have them return to the reactor, is neither described in any of the documents cited in the ISR nor obvious to a person skilled in the art.

## Supplemental Box

In case the space in any of the preceding boxes is not sufficient.  
Continuation of: V2

The subject matter of claim 7 appears to be novel and to involve an inventive step.

A constitution of each of the said first and second separation membranes wherein silica gel obtained by hydrolysis of alkoxysilane containing an ethoxy group or a methoxy group is carried in pores of an inorganic porous element, is neither described in any of the documents cited in the ISR nor obvious to a person skilled in the art.

The subject matters of claims 8-19 appear to be novel and to involve an inventive step.

A feature of a method of manufacturing aromatic carboxylic acid having (1) an oxidizing reaction process wherein an alkyl aromatic compound is subjected to a liquid-phase oxidization reaction with a gas containing oxygen in a solvent containing acetic acid in the presence of an oxidization catalyst to produce a slurry of an aromatic carboxylic acid, and (2) a solid-liquid separation process wherein the said slurry is separated into reaction mother liquor and aromatic carboxylic acid cake, wherein at least a part of the mixture containing acetic acid and water produced in the manufacturing processes is separated into a permeating gas consisting mainly of water and a non-permeating substance consisting mainly of acetic acid by means of a water-selective separation membrane, is neither described in any of the documents cited in the ISR nor obvious to a person skilled in the art.